CLAIMS

What I claim is:

1. An method for insitu minimization of infiltration and exfiltration of underground pipes having thickness between a first inner surface and a second outer surface comprising the following steps:

    a. Inserting into a pipe an inflatable and heatable bladder in communication with a controller and power source;

    b. Inflating the bladder to contact the first inner pipe surface;

    c. Heating the bladder to radiate heat through the pipe thickness to the ground;

    d. Injecting at least one chemical reactant into the ground; and

    e. Removing the bladder.

2. The invention of claim 1 further comprising using the radiating heat in creating a reaction product.

3. The invention of claim 1 wherein the means for heating is resistive electric heating within the bladder.

4. The invention of claim 1 wherein the reaction product is closed cell foam.

5. The invention of claim 1 wherein the heat source is in circumferencial contact with the first inner surface of the pipe.

6. The invention of claim 1 wherein the reaction product reduces spaces within the ground and between the ground and the second outer pipe surface.

7. The invention of claim 1 further comprising placement of at least one liner material between the bladder and the first inner surface of the pipe wall.

8. The invention of claim 1 wherein the reactant is selected from a group consisting of a hybrid polyurethane or polyester/polyurethane blend resin, and epoxy resins combined with diluents, catalysts, blowing agents and surfactants, a acrylimide, and cementitous slurry.

9. The invention of claim 3 wherein the means of resistive electric heating is carbon fibers.

10. The invention of claim 7 wherein the liner contains means for resistive electric heating.

11. A method for realigning underground pipe having an interior diameter and a thickness between a first inner surface and a second outer surface comprising the steps of:

a. Inserting into a pipe an inflatable and heatable bladder in communication with a controller and power source;

b. Inflating the bladder to contact the inner surface;

c. Injecting a reactant into at least one underground location proximate to the pipe;

d. Heating the bladder to radiate heat through the thickness of the pipe to the ground proximate to the second outer surface;

e. Using the pressure to move the pipe; and

f. removing the bladder.

12. The invention of claim 11 further comprising using the radiated heat in creating an expanding reaction product wherein the reaction product creates a pressure on the surrounding underground soil and pipe.

13. The invention of claim 11 further comprising placement of at least one liner material between the bladder and the first inner surface of the pipe.

14. The method of claim 11 wherein the inflated bladder supports the pipe diameter from the pressure of the expanding reaction product.

15. The method of claim 11 wherein the inflated bladder guides the movement of the pipe.

16. The method of claim 11 wherein the inflated bladder restricts the infiltration of the reactant or reaction product into the pipe.

17 The method of claim 11 wherein the inflated bladder reduces the formation of reaction product within the pipe interior.

18. The method of claim 11 wherein the inflated bladder guides at least one section of pipe into alignment with at least one other pipe section.

19. An method for insitu minimization of infiltration and exfiltration of underground pipes having thickness between a first inner surface and a second outer surface comprising the following steps:

a. inserting into the pipe a heatable component in communication with the ground surface having one or more liners containing thermo-setting or thermoplastic material and an inner inflatable bladder;

b. Inflating the inner bladder to press the outer liner to the first inner surface of the pipe;

c. Injecting a reactant into the ground;

d. Controllably heating the inner bladder to radiate heat through the thickness of the pipe to the ground proximate to the second outer surface;

e. Using the heat to form the outer liner to the shape of the inner surface of the pipe; and

f. removing the inflatable bladder component.

20. The method of claim 19 further comprising using the radiated heat in creating a reaction product of expanding close cell foam.

21. The method of claim 19 wherein the method of heating is resistive electric heating.

22. The method of claim 19 wherein the ground proximate to the second outer surface of the pipe is heated prior to insertion of the reactant.

23. The method of claim 19 wherein thethermosetting material of the outer liner cures while pressed to the first interior surface by the inflated inner bladder.

24. The method of claim 19 wherein the cure time of the foam proximate to second outer surface is shortened.

25. The method of claim 19 wherein the minimization of infiltration, inflow and exfiltration proximate to the connection of the sewer pipe and lateral pipe.

26. A method for repairing an interface area between two intersecting pipes, each having a pipe wall thickness between a first inner surface and an outer surface and an interior diameter formed by the first inner surface, comprising the following steps:

a. providing a flexible and expandable liner containing a hardenable heat responsive material wherein the liner has a cylindrical portion with a longitudinal axis of orientation and an outward protruding flange portion;
b. placing the liner on an expandable and heatable mold;
c. inserting the mold and liner into the interior diameter of the pipe interface of a first pipe and a second pipe;
d. maintaining communication and power means to the mold from a controller;
e. expanding the mold device to press the cylindrical liner segment to the inner surface of the first pipe and the liner flange segment to the inner surface of the second pipe;
f. injecting a reactant into the ground proximate to the outer pipe surfaces at the interface;
g. controllably heating the mold to radiate heat to the liner and through the thickness of the pipe to the ground;
h. using the heat to form the liner to the shape of the inner diameter of the first pipe and the inner surface of the second pipe at the interface with the first pipe; and
i. removing the mold.27. The invention of claim 26 further comprising using the radiated heat in creating a reaction product of expanding close cell foam.

28. An apparatus for repairing an interface area between two intersecting pipes, each having a pipe wall thickness between a first inner surface and an outer surface and an interior diameter formed by the first inner surface, comprising the following:
a. a flexible and expandable liner containing a hardenable heat responsive material wherein the liner has a cylindrical portion with a longitudinal axis of orientation and an outward protruding flange portion;
b. an expandable and heatable mold holding the liner and dimensioned to be inserted into and removed from the interior diameter of the pipe interface of a first pipe and a second pipe;

d. communication and power controller for the mold; and

e. means for injecting at least one chemical reactant into the ground.

29. The apparatus of claim 28 wherein the mold heating means are electrically resistive conductors.

30. The apparatus of claim 28 wherein the electrically resistive conductors are carbon fibers.

31. An apparatus for minimizing infiltration and exfiltration in underground pipes having interior diameter and a thickness between a first inner surface and a second outer surface and pipe connections comprising:

a. a flexible inflatable bladder dimensioned to fit within and be removed from the diameter of the underground pipe and a resistive electric heating source;

b. means to remotely inflate the bladder to cause the bladder to be circumferentially in contact with the first inner surface of the pipe;

c. means to remotely provide electric current to the bladder; and

d. means to inject at least one chemical reactant into the ground.

32. The apparatus of claim 31 further including at least one liner placed over the inflatable bladder.

33. The apparatus of claim 31 wherein at least one liner is a comprised of fabric.

34. The apparatus of claim 31 wherein the liner consists of fibers selected from the group of carbon, carbon compounds, aramid, polyester, nylon, quartz and glass.

35. The apparatus of claim 31 wherein at least one liner includes a thermoplastic material.

36. The apparatus of claim 31 wherein at least one liner includes a thermosetting material.

37. The apparatus of claim 31 wherein the liner is constructed from mechanical consolidation of the fibers.